

REMARKS

A. Request for Reconsideration

Applicants have carefully considered the matters raised by the Examiner in the outstanding Office Action but remain of the position that patentable subject matter is present. Applicants respectfully request reconsideration of the Examiner's position based on the amendments to the claims and the following remarks.

B. The Invention

The present invention is directed to a fixing device composed of a heating member, a pressure applying member, an urging member and a changeover device.

In one of the novel aspects of the invention, the changeover device increases the urging power of the urging member when the pressure applying member is brought into contact with the heating member, and the changeover device reduces the urging power of the urging member when the pressure applying member is separated from the heating member. The changeover device includes a stop member that limits the movement of the pressure applying member when the pressure applying member is separated from the heating member. In other words, when the changeover device moves the pressure applying member into contact with the heating member, the changeover device also

increases the urging force of the urging member. This is made possible, in one embodiment, because the urging member is a compression spring which is compressed when the pressure applying and the heating member are forced together. The stop member limits the expansion of the compression spring when the heating member and the pressure applying member are separated, thereby limiting the movement of the pressure applying member and leaving the compression spring partially compressed.

Applicants have discovered that by decreasing the stroke (travel distance) of the changeover device, the size of the apparatus is minimized. Furthermore, Applicants have discovered that the fixing device of the present invention lessens the working time of the apparatus thereby saving electrical power (page 39, lines 13-22).

C. Specification Amendments

Applicants have amended page 1 of the specification to note that the parent Application has issued.

D. Claim Status and Amendments

Claims 1-11 are presented for further prosecution. Claims 9-11 have been added by this amendment.

Claim 1 has been amended to clarify that the urging power of the urging member is increased under the pressure contact condition and reduced under the pressure released condition. It is submitted that claim 1 has merely been reworded to clarify the present invention and that no new matter has been added.

Claim 1 has also been amended to clarify that the stop member limits the movement of the pressure applying member under the urging force of the urging member, when the fixing device is under the pressure released condition.

Claim 5 has been amended to replace the word "during" with "under" to more accurately describe the present invention. It is submitted that this amendment is merely grammatical in nature and that no new matter has been added.

Claim 9 has been added to recite that part of the pressure applying member comes into contact with the stop member under the pressure released condition. Support for this claim can be found at page 34, lines 16-19.

Claim 10 has been added to recite that the part of the pressure applying member recited in claim 9 is the supporting shaft of the pressure applying member. Support for this claim can also be found at page 34, lines 16-19.

Claim 11 has been added to further define the pressure contact condition and the pressure released condition of the invention. Claim 11 recites that the urging power is greatest under the pressure contact condition when the pressure applying member contacts the heating member and when part of the pressure applying member does not contact the stop member. Support for this portion of claim 11 can be found in Figure 8, where pressure applying member 510 contacts heating member 500 and where supporting member 551 does not contact with stop member 542A. Claim 11 also recites that the pressure applying member is separated from the heating member during the pressure released condition and that part of the pressure applying member contacts the stop member during the pressure released condition. Support for this portion of claim 11 can be found in Figure 9, where pressure applying member 510 does not contact heating member 500 and where supporting member 661 contacts stop member 542A.

E. The Office Action

Claims 1 and 2 had been rejected as being anticipated by Suzuki (JP 4-204471). Claims 1-4, 6 and 8 had been rejected as being unpatentable over Sakai (JP 6-19344) in view of Suzuki.

In the anticipation rejection, the Examiner had stated that Suzuki teaches a heating member and a pressure applying member, and that stop member 11 of Suzuki limits the length of the urging member 13 (Figure 1 of Suzuki).

In the obviousness rejection, the Examiner had cited Sakai to teach a fixing device composed of a heating member and an urging member, wherein the stop member limits the length of the urging member. The Examiner had recognized that Sakai urges the heating member toward the pressure member, but had taken the position that it would be obvious to urge the pressure member of Sakai toward the heating member based on the teachings of Suzuki.

1. The significance of the stop member of the present invention

The stop member of the present invention lessens the travel distance of the changeover device thereby lowering the working time and saving electrical power (page 39, lines 13-22). The operation of the fixing device including the stop member of the invention is described at page 34, line 14 to page 41, line 7 and is illustrated in Figures 8-11.

Figure 8 illustrates heating member 500, pressure applying member 510, urging member 552 and stop member 542A. Figure 8 shows the pressure contact condition of the invention, since heating member 500 is in pressure contact with pressure applying member 510. Urging member 552 urges pressure applying member 510 against heating member 500 during the pressure contact condition.

Figure 9 illustrates the pressure released condition of the invention where pressure applying member 510 is separated from heating member 500. During the pressure released condition shown in Figure 9, urging member 552 urges pressure applying member 510 against stop member 542A. Thus, urging member 552 maintains urging power during both the pressure contact condition and the pressure released condition, and the stop member limits the movement of the pressure applying member toward the heating member during the pressure released condition as recited in claim 1 (page 34, line 14 to page 35, line 9).

The stop member of the invention lessens the travel distance of the changeover device since the pressure applying member 510 is stopped by stop member 542A under the pressure released condition. Without stop member 542A, urging member 552 must extend to its full uncompressed length before pressure applying member 510 separates from heating member 500. However, with stop member 542A, pressure applying member 510 separates

from heating member 500 before urging member 552 reaches its full length, since pressure applying member 510 is stopped by stop member 542A before urging member 552 reaches its full uncompressed length.

Figures 10 and 11 of the Application show that the changeover device having the stop member has a lower travel distance compared to conventional changeover devices without a stop member.

Figure 10 is a graph that plots the force of the spring vs. the compression of the spring. In Figure 10, the pressure applying roller is released from the heating roller at the full uncompressed length of the urging member (point L3), when no stop member is employed (page 35, line 23 to page 36, line 9). In contrast, when the stop member of the invention is employed, the pressure applying roller is released from the heating roller before the urging member reaches its full uncompressed length, at a point where the urging member maintains compression (point L2, page 36, lines 10-23). Thus, in the present invention, the stop member causes the pressure applying member to release from the heating member sooner compared to a conventional changeover device without a stop member. In other words, the stop member restricts the full movement of the urging member and the pressure applying member

Similarly, Figure 11 is a graph that plots the length of the urging member vs. the stroke of supporting arm 542. Figure 11 shows the stroke of the supporting arm of the changeover device is lessened by employing the stop member of the present invention. In Figure 11, when no stop member is provided, the supporting arm must reach point Q before the pressure applying member releases from the heating member (page 37, line 1 to page 38, line 5). On the other hand, when the stop member of the invention is employed, the pressure applying member releases from the heating member at point P. The stroke of the supporting arm is therefore reduced by the stop member of the invention thereby minimizing the size of the apparatus and saving electrical power (page 38, line 6 to page 37, line 22).

2. The urging power of the urging member

Claim 1 recites that the urging power of the urging member under the pressure released condition is lower than the urging power under the pressure contact condition. This aspect of the present invention is illustrated in Figures 8-10.

As discussed above, Figure 8 shows the pressure contact condition of the invention, while Figure 9 shows the pressure released condition. In the pressure contact condition of Figure 8, urging member is compressed as evidenced by the clearance between supporting arm 551 of pressure applying member 510 and

stop member 542A. In contrast, under the pressure released condition of Figure 9, urging member is less compressed as evidenced by the lack of clearance between supporting arm 551 and stop member 542A. Thus, the urging power of the urging member is lower under the pressure released condition compared to the pressure contact condition as recited in claim 1.

As a result of the fixing apparatus of the invention, the urging power of the urging member is greatest under the pressure contact condition, and the urging power can be set to a prescribed value during fixing (page 5, lines 5-9).

3. Suzuki and Sakai do not teach or suggest a fixing device where the urging power under the pressure released condition is lower than the urging power under the pressure contact condition

Suzuki and Sakai teach fixing devices that have urging powers opposite to the present invention. In other words, Suzuki and Sakai teach fixing devices where the urging power of the urging member is greatest under the pressure released condition, not under the pressure contact condition as recited in claim 1.

Figure 1 of Suzuki illustrates heating member 1, pressure member 2, spring 13, lever 12 and cam 11. When cam 11 is rotated to the position shown in Figure 1, lever 12 is forced downward thereby compressing spring 13 and separating pressure member 2 from heating member 1. When cam 11 is rotated to the position shown in Figure 2, lever 12 is forced upward since the pressure of spring 13 is released whereby pressure member 2 contacts heating member 1.

The urging power of Suzuki is opposite to the urging power of the present invention. In Suzuki, the urging power of spring 13 is greatest in Figure 1 when spring 13 is compressed and members 1 and 2 are separated. In contrast to Suzuki, the urging power of the urging member of the present invention is when members 500 and 510 are in contact (evidenced by the clearance between supporting arm 551 and stop member 542A as shown in Figure 8). Thus, Suzuki does not teach or suggest a fixing device where the urging power of the urging member under the pressure released condition, is lower than the urging power of the urging member under the pressure contact condition, as recited in claim 1.

Similarly, Sakai does not teach or suggest a fixing device where the urging power of the urging member under the pressure released condition, is lower than the urging power of the urging member under the pressure contact condition, as recited in claim 1.

Figure 1 of Sakai illustrates endless belt 9, pressure roller 17, spring 205a, swing arm 203 and cam 204. When cam 204 is rotated upward, swing arm 203 is forced upward thereby compressing spring 205a and separating endless belt 9 from pressure roller 17. When cam 204 is rotated downward, swing arm 203 is forced downward since the pressure of spring 205a is released whereby endless belt 9 contacts pressure roller 17.

Similar to Suzuki, the urging power of the urging member of Sakai is opposite to the urging power of the present invention. In Sakai, the urging power of spring 205a is greatest when spring 205a is compressed and members 9 and 17 are separated. In contrast to Sakai, the urging power of the urging member of the present invention is greatest when members 500 and 510 are in contact (evidenced by the clearance between supporting arm 551 and stop member 542A in Figure 8). Thus, Sakai does not teach or suggest a fixing device where the urging power of the urging member under the pressure released condition, is lower than the urging power of the urging member under the pressure contact condition, as recited in claim 1.

Applicants therefore respectfully submit that Suzuki and Sakai do not teach or suggest fixing devices where the urging power of the urging member under the pressure released condition is lower than the urging power under the pressure contact condition as recited in claim 1.

4. Suzuki and Sakai do not teach or suggest the stop member of the invention, and it would not be obvious to employ the stop member of the invention since Suzuki and Sakai urge the supporting levers

The Examiner had pointed to element 11 of Suzuki as teaching the stop member of the present invention (section 3 of the Office Action). Similarly, the Examiner had pointed to Figure 1 of Sakai to show the use of a stop member (section 6 of the Office Action). Applicants respectfully submit that Suzuki and Sakai do not teach or suggest the stop member of the invention.

As discussed in section 1 above and recited in claim 1, the stop member of the invention limits the movement of the pressure applying member toward the heating member under the pressure released condition, as the pressure applying member separates from the heating member. The stop member therefore gives a shorter stroke to the changeover device which lowers operating time and saves electrical energy. The fixing device of the

invention overcomes conventional drawbacks where the changeover device had to be moved a long distance before the pressure applying member separated from the heating member, the long distance being required to reach the uncompressed length of the urging member.

The fixing devices of Suzuki and Sakai are different than the present invention and are also different than conventional fixing devices that the present invention was designed to overcome. Thus, Suzuki and Sakai do not require the spring to reach its full uncompressed length before the pressure member releases from the heating member.

Suzuki and Sakai do not require the spring to reach its full uncompressed length, since spring 13 of Suzuki urges lever 12, not pressure roller 2, and spring 205a of Sakai urges swing arm 203, not belt 9. Thus, as cam 11 of Suzuki and cam 203 of Sakai rotate to the pressure released conditions, springs 13 and 205a respectively urge lever 12 and swing arm 203, not pressure member 2 and belt 9.

Thus, Suzuki and Sakai do not suffer from conventional problems where changeover devices had to be moved a large distance to release the pressure member from the heating member, since the forces of springs 13 and 205a of Suzuki and Sakai are against lever 12 and swing arm 203, not against pressure roller 2 and belt 9.

Suzuki and Sakai do not teach or suggest the fixing device and the stop member of claim 1. First, the urging power of Suzuki and Sakai is opposite to the urging power of the present invention recited in claim 1. Second, Suzuki and Sakai do not teach or suggest the stop member of the invention that limits the movement of the pressure member under the pressure released condition as recited in claim 1. Third, it would not be obvious to add the stop member of the invention to Suzuki and Sakai, since the fixing devices of Suzuki and Sakai respectively urge lever 12 and swing arm 203 under the pressure released condition, not the pressure applying members.

Applicants therefore respectfully submit that the present invention is patentable over Suzuki and Sakai taken alone or in combination.

F. Ogida, Ishii, Hatta, Nakai and Sanba

The Examiner had cited but had not relied on Ogida (JP 8-314320), Ishii (JP 1-270088), Hatta (JP 6-083232), Nakai (JP 9-179435) and Sanba (JP 10-063131).

Figure 3 of Ogida illustrates spring 13, pressure roller 83 and heating roller 80. Similar to Suzuki and Sakai, Ogida does not teach or suggest a fixing device where the urging power under the pressure released condition is lower than the urging

power under the pressure contact condition. In addition, Ogida does not teach or suggest the stop member of the invention.

Figure 1 of Ishii illustrates spring 3, pressure roller 2 and heating roller 1. Similar to Suzuki and Sakai, Ishii does not teach or suggest a fixing device where the urging power under the pressure released condition is lower than the urging power under the pressure contact condition. In addition, Ishii does not teach or suggest the stop member of the invention.

Figure 1 of Hatta illustrates spring 11, pressure roller 2 and heating roller 3. Similar to Suzuki and Sakai, Hatta does not teach or suggest a fixing device where the urging power under the pressure released condition is lower than the urging power under the pressure contact condition. In addition, Hatta does not teach or suggest the stop member of the invention.

Figures 1 and 2 of Nakai illustrate spring 17, pressure roller 13 and heating roller 11. Similar to Suzuki and Sakai, Nakai does not teach or suggest a fixing device where the urging power under the pressure released condition is lower than the urging power under the pressure contact condition. In addition, Nakai does not teach or suggest the stop member of the invention. Nakai also teaches that pressure roller 13 and heating roller 11 always remain in contact.

Figures 1 and 2 of Sanba illustrate spring clutch 11, a pressure roller and a heating roller. Similar to Suzuki and Sakai, Sanba does not teach or suggest a fixing device where the urging power under the pressure released condition is lower than the urging power under the pressure contact condition. In addition, Sanba does not teach or suggest the stop member of the invention.

Applicants therefore respectfully submit that the present invention is patentable over all the cited references taken alone or in combination.

G. Claim of Priority

Applicants note that the present Application is a CIP of U.S. Serial No. 10/146,365, now U.S. Patent 6,782,231. However, the Office Action Summary page of the present Application does not acknowledge the foreign priority claim made in the '365 Application. Applicant presumes that the Examiner has noted the foreign priority claim in the present Application.

H. Conclusion

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested. Should any extensions of time or fees be necessary in order to maintain this Application in pending

condition, appropriate requests are hereby made and authorization is given to debit Account # 02-2275.

Respectfully submitted,

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